BC 549270

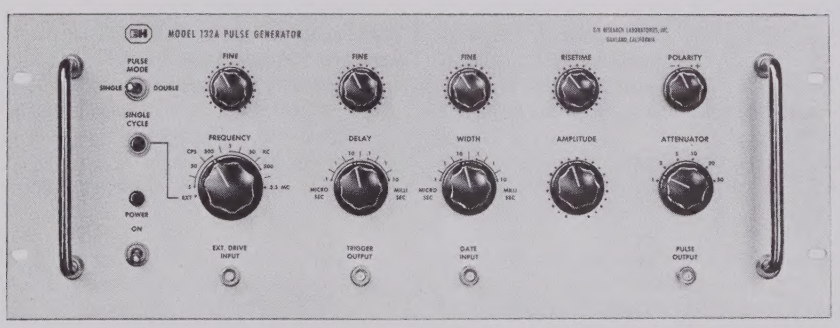
MODEL 132A
PULSE GENERATOR

E-H RESEARCH LABORATORIES, INC.
163 ADELINE STREET · OAKLAND, CALIFORNIA 94607

OFFICIAL RECORDS STATION
FILE COPY
FACILITIES NOV 27 1973



MODEL 132A
PULSE GENERATOR



E-H RESEARCH LABORATORIES, INC.
163 ADELINE STREET · OAKLAND, CALIFORNIA 94607 · (415) 834-3030 · TWX-910-366-7258
IN EUROPE: E-H Research Laboratories (Ned) N.V., P.O. Box 402, Eindhoven, The Netherlands

Issued 3-15-67

FOREWORD

Units, abbreviations and prefixes of the International System of Units (SI) are used in this manual. Discrepancies may be noted between the terms used in the text and the instrument panel markings (e. g. ; hertz, kilohertz, megahertz for cps, kilocycles, megacycles, etc.)

The National Bureau of Standards announced its approval of the SI in February 1964, and subsequently the document was adopted by Congress as a national standard.

SECTION 1
CHARACTERISTICS

1-1 GENERAL

The E-H Model 132A Pulse Generator is designed to provide fast risetime, high current pulses over a broad range of pulse widths and repetition rates. It is suitable for a variety of applications including design problems involving magnetic materials, solid state research, high-speed diode and transistor switching characteristics, and high-current logic and memory circuits. It includes provisions for external driving or gating, provides a trigger for sync purposes, and an output attenuator.

The Model 132A uses unique latched output circuitry to form the pulse. This method of pulse generation was developed by E-H, and is the reason for the broad capabilities of the Model 132A. Basically, the latch is a bistable circuit. One stable state is zero output volts, and the other stable state is some positive or negative output that is determined by the AMPLITUDE and POLARITY controls. The latch is triggered from one state to the other by a series of trigger pulses generated by the timing circuits. The latch switches states in typically 10 nanoseconds -- providing the fast risetime pulses specified.

One of the most important features of the latch circuitry is the freedom of all waveform adjustment controls. The output pulse is extremely clean and fast under all conditions of amplitude, repetition rate, pulse width, etc. No "trimming up" of the pulse is required. The only waveform control is the front-panel RISETIME control, which is provided as a convenience to the user.

The timing circuit of the Model 132A is entirely transistorized to ensure reliable operation indefinitely. The vacuum tube in the output latch is a premium-type that is rated for 10,000 hours life. In addition, the Model 132A has been quality constructed to provide long trouble-free operation.

1-2 SPECIFICATIONS

REPETITION RATES: 5 hertz to 3.5 megahertz internally selected by front panel step and vernier controls. The instrument may be externally driven from zero to 3.5 megahertz by a negative 4 volt pulse.

RISETIME: Positive pulse; less than 12 nanoseconds; variable to more than 100 nanoseconds. Negative pulse; less than 10 nanoseconds; variable to more than 100 nanoseconds.

FALLTIME: Less than 14 nanoseconds, either polarity.

PULSE OUTPUT: The maximum pulse amplitude is 50 volts into 50 ohms, either polarity. An amplitude control and step attenuator provide continuous attenuation to 150:1.

PULSE WIDTH: Less than 100 nanoseconds to more than 10 milliseconds, continuously variable by step and vernier controls.

PULSE DELAY: Less than 100 nanoseconds to more than 10 milliseconds, continuously variable by step and vernier controls.

DUTY FACTOR: The maximum average current out is 250 milliamps. Thus, a 25% duty factor is available at 50 volts amplitude and a 50% duty factor is available at 25 volts amplitude. Automatic limiting prevents overload.

DROOP: 5% or less at 10 milliseconds width.

POLARITY: Output pulses are either positive or negative, but not simultaneous.

TRIGGER OUTPUT: A 4 volt negative pulse, into 2K ohms, approximately 50 nanoseconds wide, is provided for sync purposes.

GATE: A 5 volt negative signal at the GATE INPUT will interrupt the pulse train for the duration of its presence. Input impedance is 2.4K ohms.

DOUBLE PULSE: A front panel switch provides either single or double pulse operation. In double pulse mode, maximum repetition rate is 500 kilohertz for 1 megahertz double pulse rate. Pulses are identical in amplitude, width and polarity. Minimum spacing is approximately three times the pulse width. Spacing is determined by the DELAY control.

SINGLE CYCLE: A front panel pushbutton provides single cycle operation.

DIMENSIONS: Rack Mounted: 19" wide, 7" high. End frames are available for bench use. Weight: 22 lbs. net; 30 lbs. packed; 42 lbs. packed for export.

POWER REQUIREMENTS: 105/125 volts, 50/60 cycles, 200 volt-amperes.

1-3 ACCESSORIES

END FRAMES are available for bench use.

For short pulses, the E-H Model ZT-SERIES PULSE TRANSFORMERS invert the output pulse or match other impedances. Standard impedances are any permutation of 50, 93, 125, 185, or 200 ohms, normal or inverting. Coaxial body with BNC connectors.

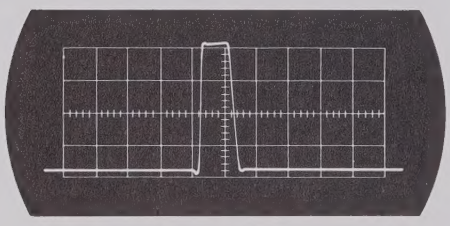
E-H Model RT RISETIME INTEGRATORS. These provide precise risetimes in applications where responses to slow risetimes are important. Standard risetimes of 5, 10, 20, and 100 nanoseconds; other values on special order.

E-H Model 921 VARIABLE DELAY GENERATOR may be used between an external driving source and Model 132A to obtain precise positioning; or between two or more Models 132A's. Continuously variable delays from 50 nanoseconds to 100 microseconds.

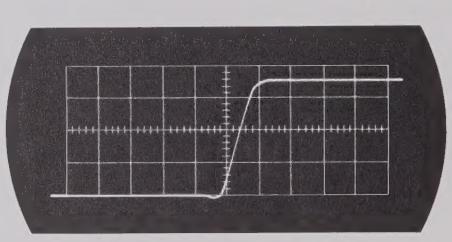
ADDITIONAL ACCESSORIES. The E-H BNC Series accessories are compatible with the E-H Model 132A and other instruments with BNC connectors. For further accessory information, refer to the data at the back of this manual.

1-4 APPLICATIONS

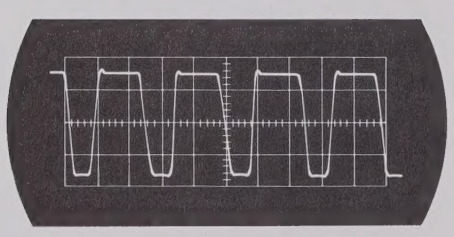
For more information concerning applications, pulse definitions, and pulse generating circuits, consult the E-H booklet entitled "Pulse Generators."



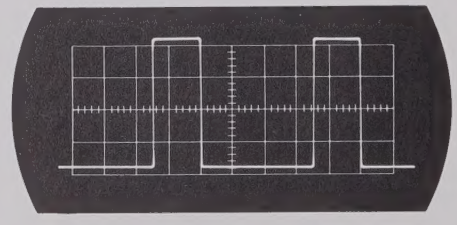
Positive pulse.
10v/cm, 100ns/cm.



Leading edge of positive pulse.
15v/cm, 10ns/cm.



Negative pulse train at max. rep rate.
10v/cm, 100ns/cm.



Positive pulse train.
10 v/cm, 10μs/cm.

Figure 1-1. E-H Model 132A - Typical waveforms.
(All waveforms observed on a Tektronix Type 545 oscilloscope with Type "L" plug-in.)

SECTION 2
OPERATING INFORMATION

2-1 UNPACKING

Immediately after unpacking the instrument, carefully inspect and evaluate the condition of the shipping container and instrument for evidence of damage that might have occurred during shipment or handling. If damage is noted, the responsible carrier or agency should be promptly notified.

2-2 234 VOLT OPERATION

The internal power supply of the Model 132A is normally wired for 117 vac operation. Simple rewiring of the transformer primary permits operation at 234 volts. Refer to the schematic diagram at the back of this manual for the proper primary connections.

2-3 OUTPUT IMPEDANCE

The Model 132A is a current source when the output pulse is negative and a voltage source when the output pulse is positive. Although the impedance at the PULSE OUTPUT connector is not 50 ohms, the instrument is designed to operate into a 50-ohm resistive load. Operation into any other impedance will cause some pulse distortion. Loads with appreciable capacitive or inductive components will have a marked effect on the leading and trailing edges of the pulse.

Use the Model ZT Pulse Transformer to match the Model 132A output to other impedances.

NOTE

For best waveform fidelity, the Model 132A terminating impedance should always be as close to 50 ohms as possible.

2-4 CABLES, CONNECTORS AND ATTENUATORS

The sharp rising pulse of the 132A has appreciable frequency components up to 35 megahertz. If any of these high frequency components are attenuated through the use of connectors, cables, or attenuators that do not have a flat frequency response in excess of these frequencies, degradation of the pulse risetime will result. Mismatch effects can also degrade the pulse waveform: consequently, consideration and care must be taken to preserve the quality of the Model 132A pulse output when coupling it to the system or device under test.

Some of the precautions to observe in coupling the pulse outputs of this instrument are:

1) Always terminate the PULSE OUTPUT of the Model 132A in a 50-ohm resistive load.

2) If the input impedance of the device or system under test is other than 50 ohms, use an impedance matching device so that mismatch effects will not degrade the pulse waveform.

3) Make sure that all connectors, attenuators, and cables are of proper impedance and have a flat frequency response in excess of 35 megacycles. The GR and Tektronix coaxial attenuators are recommended for use. Only high-quality 50-ohm cable should be used at the Model 132A BNC PULSE OUTPUT connector such as RG-58C/U or RG-213/U.

2-5 OPERATING CONTROLS AND CONNECTORS

The front panel operating controls, and the function of each, are listed in Table 2-1.

2-6 DUTY FACTOR

The duty factor limitation ensures conservative operation and long life of the output tubes. The duty factor is controlled electronically by monitoring the output current to maintain it at a maximum of 250 milliamperes, average. Effectively, when the duty factor reaches 25 per cent, the amplitude of the output pulse is proportionately decreased as the duty factor is increased.

NOTE

The minimum available pulse width and the duty factor limitation prevents full output at 3.5 megahertz.

Typically, pulse widths of up to 80 per cent of the period can be obtained. Extending the pulse width past the normal period will cause the generator to scale down in frequency, or unusual pulse distortion conditions to appear. At no time, however, can damage occur to the instrument.

TABLE 2-1 OPERATING CONTROLS AND CONNECTORS

ITEM	FUNCTION
POWER	Connect the line cord to a 115 vac 50/60 Hz power source. Turn the POWER switch to ON. The fan will start, and the POWER lamp will light.
FREQUENCY	Pulse repetition frequency is variable in decade steps by the coarse FREQUENCY selector switch. The FINE control serves as a vernier for each range. With these controls, the pulse repetition frequency is continuously variable from 5 Hz to 3.5 megahertz with overlap to adjacent ranges.
DELAY	The DELAY controls vary the time between the trigger pulse and the output pulse. Delay time is variable in decade steps by the coarse DELAY selector switch. The FINE control serves as a vernier for each range. Delay time is continuously variable from 100 nanoseconds to 10 milliseconds, with overlap to adjacent ranges.
WIDTH	The WIDTH controls vary the pulse width; width is variable in decade steps by the coarse WIDTH selector switch. The FINE control serves as a vernier for each range. These controls permit pulse width to be continuously variable from 100 nanoseconds to 10 milliseconds, with overlap to adjacent ranges.
AMPLITUDE	The amplitude of the output pulse is continuously variable over an approximate 3:1 range by the AMPLITUDE control.
ATTENUATOR	The ATTENUATOR provides six step attenuation ratios from 1:1 to 50:1.
POLARITY	The POLARITY switch selects either positive or negative output pulses.
RISETIME	The RISETIME control varies the leading edge risetime for 12 to 100 nanoseconds.
SINGLE CYCLE	The SINGLE CYCLE control provides a single output pulse each time the SINGLE CYCLE button is depressed. To operate, turn the FREQUENCY selector switch to EXT. with the FINE frequency vernier turned fully counterclockwise.
PULSE MODE SINGLE - DOUBLE	The PULSE MODE switch provides for the addition of a second pulse to the normal output pulse train, when required. For SINGLE operation, there is one output pulse during the pulse repetition period; it follows the trigger pulse by the delay time. During DOUBLE operation, a second pulse is added to the output pulse train during the pulse repetition period; the second pulse is approximately coincident with the trigger pulse. The trigger coincident pulse is separated from the original pulse by the delay time. (Continued)

ITEM	FUNCTION
	The DOUBLE pulse mode is operational from 5 Hz to 500 kilohertz, but is inhibited in the highest FREQUENCY range (500 kilohertz to 3.5 megahertz). For best results, the output pulse width should be less than approximately one third of the delay time, and delay time should be less than the pulse repetition period.
EXT. DRIVE INPUT CONNECTOR	Turn the FREQUENCY range selector switch to EXT. and the FINE frequency vernier fully counterclockwise. Apply the negative 4 volt drive signal to the EXT. DRIVE INPUT connector.
GATE INPUT CONNECTOR	A negative 5 volt signal applied to the GATE INPUT will interrupt the output pulse train as long as the signal remains.
PULSE OUTPUT CONNECTOR	The output pulse train is taken from the PULSE OUTPUT connector. The output is designed to operate into a 50-ohm, resistive load. The Model 132A should always be operated with a load at the output.
TRIGGER OUTPUT CONNECTOR	The TRIGGER OUTPUT connector delivers a negative 5 volt pulse which is useful for synchronizing oscilloscopes or other instruments. For best results, operate with a 50-ohm load, such as a 50-ohm isolation pad or an attenuator.


Digitized by the Internet Archive
in 2024

https://archive.org/details/manualsplus_01188

SECTION 3
PARTS LIST

3-1 ORDERING INFORMATION

Replacement parts may be ordered through your E-H Representative or from the factory. To be certain that you receive the proper replacement parts, always include the following information with your order:

a. Model Number and Serial Number of the instrument on which the replacement parts will be installed.

b. Circuit or Drawing Reference for which each part is intended.

c. E-H Part Number.

This instrument contains several factory-selected components to ensure optimum performance. In no case should a diode or transistor be replaced with one from a different manufacturer, unless it is on the specific recommendation of E-H.

When replacement parts are necessary, be sure to order through the E-H Customer Service organization. In this way, we can best serve you by providing up-to-date factory recommended parts and service information.

3-2 WARRANTY

This instrument is guaranteed to be free from defects in material and workmanship. Our obligation is limited to repairing the instrument should it prove to be defective, upon our examination, within one (1) year after the purchase date. Fuses and batteries are specifically excluded from warranty. Electron tubes, transistors, and diodes are warranted for six (6) months.

For In-Warranty repair of this instrument, contact E-H Research Laboratories, Inc., Customer Service Department, and provide:

a. Instrument Model Number and Serial Number.

b. Full details concerning the nature of the malfunction.

Shipping instructions, or repair information and parts, will be sent to you promptly.

CUSTOMER SERVICE DEPARTMENT, E-H RESEARCH LABORATORIES, INC.

163 ADELINE STREET, OAKLAND, CALIFORNIA - Phone: TE 4-3030, Area Code 415

3-3 CAPACITORS

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
C1	47 μf, ±20%, 20v, Tantalum	318-001
C2	4.7 μf, ±20%, 20v, Tantalum	318-002
C3	.5 μf, ±5%, 200v, Mylar	320-009
C4	.05 μf, ±5%, 200v, Mylar	320-005
C5	.005 μf, ±5%, 500v, Polystyrene	326-004
C6	500 pf, ±10%, 1kv, Ceramic	311-009
C7	.001 μf, ±5%, 500v, Poly.	326-005
C8	25 μf, 25 wvdc, Electrolytic	316-028
C9	.01 μf, ±20%, 600v, Ceramic	311-012
C10	25 μf, 25 wvdc, Electrolytic	316-028
C11	.01 μf, ±20%, 600v, Ceramic	311-012
C12	10 pf, ±10%, 1kv, Ceramic	311-001
C13	100 pf, ±10%, 1kv, Ceramic	311-007
C14	.01 μf, ±20%, 600v, Ceramic	311-012
C15	150 pf, ±10%, 1kv, Ceramic	311-008
C16	.001 μf, ±5%, 500v, Polystyrene	326-005
C17	.01 μf, ±5%, 500v, Polystyrene	326-006
C18	.1 μf, ±5%, 200v, Metalized Myl.	320-007
C19	1 μf, ±5%, 200v, Mylar	320-011
C20	10 μf, ±10%, 20wvdc, Tantalum	318-005
C21	25 μf, 25 wvdc, Electrolytic	316-028
C22	.01 μf, ±20%, 600v, Ceramic	311-012
C23	25 μf, 25 wvdc, Electrolytic	316-028
C24	.01 μf, ±20%, 600v, Ceramic	311-012
C25	25 μf, 25 wvdc, Electrolytic	316-028
C26	.01 μf, ±20%, 600v, Ceramic	311-012
C27	25 μf, 25 wvdc, Electrolytic	316-028
C28	.01 μf, ±20%, 600v, Ceramic	311-012
C29	.001 μf, ±5%, 500v Polystyrene	326-005
C30	.01 μf, ±5%, 500v, Polystyrene	326-006
C31	.1 μf, ±5%, 200v, Metalized Myl.	320-007
C32	1 μf, ±5%, 200v, Metalized Myl.	320-011
C33	10 μf, 20v, Tantalum	318-005
C34	.01 μf, ±20%, 600v, Ceramic	311-012
C35	25 μf, 25 wvdc, Electrolytic	316-028
C36	100 pf, ±10%, 1kv, Ceramic	311-007
C37	150 pf, ±10%, 1kv, Ceramic	311-008
C38	100 pf, ±10%, 1kv, Ceramic	311-007
C39	.001 μf, ±10%, 1kv, Ceramic	311-010
C40	50 pf, ±10%, 1kv, Ceramic	311-006
C41	.01 μf, ±20%, 600v, Ceramic	311-012
C42	25 μf, 25 wvdc, Electrolytic	316-028
C43	.1 μf, +80-30%, 75v, Ceramic	311-014
C44	.1 μf, +80-20%, 500v, Ceramic	311-023
C45	.01 μf, ±20%, 600v, Ceramic	311-012
C46	1 μf, ±5%, 200v, Metalized Myl.	320-011
C47	.01 μf, ±20%, 600v, Ceramic	311-012
C48	.01 μf, ±20%, 600v, Ceramic	311-012
C49	7-100 pf, 250v, Variable, Ceramic	332-003
C50	100 pf, ±10%, 1kv, Ceramic	311-007
C51	.01 ±20%, 600v, Ceramic	311-012
C52	.01 μf, ±20%, 600v, Ceramic	311-012
C53	100 pf, ±10%, 1kv, Ceramic	311-007
C57	.01 μf, ±20%, 600 v	311-012
C101	250 μf, 300 wvdc, Electrolytic	316-040
C102	100 μf, 450 wvdc, Electrolytic	316-008
C103	100 μf, 450 wvdc, Electrolytic	316-008
C104	1 μf, ±20%, 200v, Mylar	320-010
C105	.1 μf, +80-30%, 75 wvdc, Cer.	311-014
C106	250 μf, 12 wvdc, Electrolytic	316-031
C107	500 pf, ±10%, 1kv, Ceramic	311-009
C108	100-100 μf, 350 wvdc, Electrolytic	316-022
C109	4000 μf, 15 wvdc, Electrolytic	316-003
C110	4000 μf, 15 wvdc, Electrolytic	316-003
C111	250 μf, 12 wvdc, Electrolytic	316-031
C112	250 μf, 12 wvdc, Electrolytic	316-031
C113	250 μf, 12 wvdc, Electrolytic	316-031
C114	250 μf, 12 wvdc, Electrolytic	316-031

3-4 DIODES

CR1	1N746A; 3.3v ±5%, 400 mw zener	374-017
CR2	Not used	
CR3	1N751A; 5.1v, ±5%, 400 mw zener	374-022
CR4	1N914B	376-022
CR5	1N270	376-031
CR6	1N270	376-031
CR7	1N746A; 3.3v, ±5%, 400 mw zener	347-017
CR8	1N270	347-031
CR9	1N270	347-031
CR10	1N270	347-031
CR11	CGD1419	11742
CR12	CGD1419	11742
CR13	CGD1419	11742
CR14	1N270	376-031
CR15	CGD1419	11742
CR16	CGD1419	11742
CR17	1N270	376-031
CR18	CGD1419	11742
CR19	1N270	376-031
CR20	CGD1419	11742
CR21	CGD1419	11742
CR22	CGD1419	11742
CR23	CGD1419	11742
CR24	CGD1419	11742
CR25	CGD1419	11742
CR26	1N914B	376-022
CR27	1N914B	376-022

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
Diodes Contd.		
CR28	1.5 M39Z5; 39v, ±10%, 1.5w, zener	374-001
CR29	1N914B	376-022
CR30	1N914B	376-022
CR31	1N270	376-031
CR32	1N270	376-031
CR33	CGD1419	11742
CR101	1N4005	376-034
CR102	1N4005	376-034
CR103	1N4005	376-034
CR104	1N4005	376-034
CR105	1N4005	376-034
CR106	1N4005	376-034
CR107	1N4005	376-034
CR108	1N4005	376-034
CR109	1N4005	376-034
CR110	1N4005	376-034
CR111	1N753; 6.2v, ±10%, 400mw zener	374-019

3-5 ELECTRON TUBES

V1	7534/E130L, Pentode (Factory Selected)	10485
V101	6080, Twin Triode	670-017
V102	6080, Twin Triode	670-017
V103	6AU6, Pentode	670-010
V104	6AU6, Pentode	670-010
V105	OA2, Voltage Regulator	670-007
V106	7119, Twin Triode	670-021

3-6 INDUCTORS

L1	Choke Assembly	11456
L2	Choke Assembly	11456
L3	Choke Assembly	11456
L4	Choke Assembly	11456
L5	Choke Assembly	11456
L6	Choke Assembly	11456
L7	Choke Assembly	11456
L8	Choke Assembly	11456
L9	Filament Choke Assembly	10558
L10	1.5 μh Choke	335-002
L11	1.5 μh Choke	335-002
L12	1.5 μh Choke	335-002
L13	1.5 μh Choke	335-002

3-7 RESISTORS

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
R1	2K, ±5%, 1/2w, carb. comp.	596-202
R2	2.5K, Pot., 10%, 2w, linear taper, composition	550-009
R3	100 Ω, ± 5%, 1/2w, carb. comp.	596-101
R4	10Ω, ±5%, 1/2w, carb. comp.	596-100
R5	180Ω, ±5%, 1/2w, carb. comp.	596-181
R6	10Ω, ±5%, 1/2w, carb. comp.	596-100
R7	150Ω, ±5%, 1/2w, carb. comp.	596-151
R8	200Ω, ±5%, 1/2w, carb. comp.	596-201
R9	1K, ±5%, 1/2w, carb. comp.	596-102
R10	3K, ±5%, 1/2w, carb. comp.	596-302
R11	1 Meg, ±5%, 1/2w, carb. comp.	596-105
R12	22K, ±5%, 1/2w, carb. comp.	596-223
R13	300Ω, ±5%, 1/2w, carb. comp.	596-301
R14	18K, ±5%, 1/2w, carb. comp.	596-183
R15	2.4K, ±5%, 1/2w, carb. comp.	596-242
R16	180Ω, ±5%, 1/2w, carb. comp.	596-181
R17	220Ω, ±5%, 1/2w, carb. comp.	596-221
R18	30K, ±5%, 1/2w, carb. comp.	596-303
R19	75Ω, ±5%, 1/2w, carb. comp.	596-750
R20	750Ω, ±5%, 1/2w, carb. comp.	596-751
R21	330Ω, ±5%, 1/2w, carb. comp.	596-331
R22	430Ω, ±5%, 1/2w, carb. comp.	596-431
R23	180Ω, ±5%, 1/2w, carb. comp.	596-181
R24	51Ω, ±5%, 1/2w, carb. comp.	596-510
R25	1K, ±5%, 1/2w, carb. comp.	596-102
R26	10K, Pot., 10%, 2w, linear taper, composition	550-012
R27	560Ω, ±5%, 1/2w, carb. comp.	596-561
R28	220Ω, ±5%, 1/2w, carb. comp.	596-221
R29	1KΩ, ±5%, 1/2w, carb. comp.	596-102
R30	2K, ±5%, 1/2w, carb. comp.	596-202
R31	300Ω, ±5%, 1/2w, carb. comp.	596-301
R32	330Ω, ±5%, 1/2w, carb. comp.	596-331
R33	430Ω, ±5%, 1/2w, carb. comp.	596-431
R34	750Ω, ±5%, 1/2w, carb. comp.	596-751
R35	75Ω, ±5%, 1/2w, carb. comp.	596-750
R36	51Ω, ±5%, 1/2w, carb. comp.	596-510
R37	160Ω, ±5%, 1/2w, carb. comp.	596-161
R38	1K, ±5%, 1/2w, carb. comp.	596-102
R39	10K, Pot., 10%, 2w, linear taper, composition.	550-012
R40	560Ω, ±5%, 1/2w, carb. comp.	596-561
R41	180Ω, ±5%, 1/2w, carb. comp.	596-181
R42	110Ω, ±5%, 1/2w, carb. comp.	596-111
R43	2K, ±5%, 1/2w, carb. comp.	596-202
R44	10K, ±5%, 1/2w, carb. comp.	596-103
R45	2 Meg, ±5%, 1/2w, carb. comp.	596-205
R46	3.3K, ±5%, 1/2w, carb. comp.	596-332
R47	330Ω, ±5%, 1/2w, carb. comp.	596-331
R48	5.1K, ±5%, 1/2w, carb. comp.	596-512
R49	430Ω, ±5%, 1/2w, carb. comp.	596-431

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
Resistors Contd.		
R50	2K, ±5%, 1/2w, carb. comp.	596-202
R51	22K, ±5%, 1w, carb. comp.	597-223
R52	16K, ±5%, 2w, carb. comp.	598-163
R53	16K, ±5%, 2w, carb. comp.	598-163
R54	56K, ±5%, 1/2w, carb. comp.	596-563
R55	4.3K, ±5%, 1/2w, carb. comp.	596-432
R56	Not used	
R57	33K, ±5%, 2w, carb. comp. (Factory Selected)	598-333
R58	33K, ±5%, 2w, carb. comp. (Factory Selected)	598-333
R59	33K, ±5%, 2w, carb. comp. (Factory Selected)	598-333
R60	500Ω, Pot., 10%, 1/2w, linear taper, composition	550-029
R61	15Ω, ±5%, 1/2w, carb. comp.	596-150
R62	110Ω, ±5%, 1/2w, carb. comp.	596-111
R63	240Ω, ±5%, 2w, carb. comp.	598-241
R64	240Ω, ±5%, 2w, carb. comp.	598-241
R65	240Ω, ±5%, 2w, carb. comp.	598-241
R66	240Ω, ±5%, 2w, carb. comp.	598-241
R67	100Ω, ±5%, 2w, carb. comp.	598-101
R68	100Ω, ±5%, 2w, carb. comp.	598-101
R69	100Ω, ±5%, 2w, carb. comp.	598-101
R70	100Ω, ±5%, 2w, carb. comp.	598-101
R71	240Ω, ±5%, 2w, carb. comp.	598-241
R72	240Ω, ±5%, 2w, carb. comp.	598-241
R73	240Ω, ±5%, 2w, carb. comp.	598-241
R74	240Ω, ±5%, 2w, carb. comp.	598-241
R75	240Ω, ±5%, 2w, carb. comp.	598-241
R76	240Ω, ±5%, 2w, carb. comp.	598-241
R77	13Ω, ±5%, 1w, carb. comp.	597-130
R78	13Ω, ±5%, 1w, carb. comp.	597-130
R79	13Ω, ±5%, 1w, carb. comp.	597-130
R80	12Ω, ±5%, 1w, carb. comp.	597-120
R81	3.3Ω, ±5%, 1w, carb. comp.	597-033
R82	5.1Ω, ±5%, 1w, carb. comp.	597-051
R83	5.1Ω, ±5%, 1/2w, carb. comp.	596-051
R84	82K, ±5%, 1/2w, carb. comp.	596-823
R85	3.9K, ±5%, 1/2w, carb. comp.	596-392
R86	47K, ±5%, 1w, carb. comp.	597-473
R87	1K, ±5%, 1/2w, carb. comp.	596-102
R88	240Ω, ±5%, 2w, carb. comp.	598-241
R89	240Ω, ±5%, 2w, carb. comp.	598-241
R101	30Ω, ±5%, 1w, carb. comp.	597-300
R102	5Ω, 10w, wirewound	610-017
R103	30Ω, ±5%, 1w, carb. comp.	597-300
R104	4K, 10w, wirewound	610-020
R105	62K, ±5%, 1/2w, carb. comp.	596-623
R106	160K, ±5%, 1/2w, carb. comp.	596-164
R107	360K, ±5%, 1/2w, carb. comp.	596-364
R108	100Ω, ±5%, 1/2w, carb. comp.	596-101
R109	22Ω, ±5%, 1/2w, carb. comp.	596-220
R110	30K, ±5%, 1w, carb. comp.	597-303
R111	150K, ±5%, 1/2w, carb. comp.	596-154
R112	50K, Pot., 10%, 2w, Locking, linear taper	545-008
R113	160K, ±5%, 1/2w, carb. comp.	596-164
R114	22Ω, ±5%, 1/2w, carb. comp.	596-220
R115	100Ω, ±5%, 1/2w, carb. comp.	596-101
R116	100Ω, ±5%, 1/2w, carb. comp.	596-101
R117	22Ω, ±5%, 1/2w, carb. comp.	596-220
R118	22Ω, ±5%, 1/2w, carb. comp.	596-220
R119	100Ω, ±5%, 1/2w, carb. comp.	596-101
R120	100K, ±5%, 1/2w, carb. comp.	596-104
R121	51K, ±5%, 1/2w, carb. comp.	596-513
R122	180Ω, ±5%, 1/2w, carb. comp.	596-181
R123	27K, ±5%, 2w, carb. comp.	598-273
R124	10K, ±5%, 1/2w, carb. comp.	596-103
R125	5Ω, 3w, 5%, wirewound	610-003
R126	100K, ±5%, 1/2w, carb. comp.	596-104
R127	160K, ±5%, 1/2w, carb. comp.	596-164
R128	100K, Pot., 10%, 2w, linear taper composition	550-006
R129	150K, ±5%, 1/2w, carb. comp.	596-154
R130	2.7Ω, ±5%, 1w, carb. comp.	597-027
R131	2.7Ω. ±5%, 1w, carb. comp.	597-027
R132	150Ω. ±5%, 1/2w, carb. comp.	596-151
R133	150Ω, ±5%, 1/2w, carb. comp.	596-151
R134	200Ω, Pot., 10%, 1/2w, Miniature, Multiturn, linear taper, wirewound	551-017
R135	510Ω, ±5%, 1/2w, carb. comp.	596-511
R136	510Ω, ±5%, 1/2w, carb. comp.	596-511
R137	510Ω, ±5%, 1/2w, carb. comp.	596-511
R138	510Ω, ±5%, 1/2w, carb. comp.	596-511
R139	750Ω, ±5%, 1/2w, carb. comp.	596-751
R140	510Ω, ±5%, 1/2w, carb. comp.	596-511
R141	15Ω, ±5%, 1/2w, carb. comp.	596-150
R142	511Ω, ±1%, 1/2w, metal film	618-002
R143	475Ω, ±1%, 1/2w, metal film	618-015
R144	100K, ±5%, 1/2w, carb. comp.	596-104
R145	Not used	
R146	39K, ±5%, 2w, carb. comp.	598-393

3-8 SWITCHES

S1	12 Pos., Single Pole Rotary	624-040
S2	6 Pos., 2 Pole Rotary	624-005
S3	6 Pos., 2 Pole Rotary	624-005
S4	2 Pos., 5 Pole Rotary	624-008

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
Switches Contd.		
S5	6 Pos., 2 Pole Rotary	624-004
S6	Pushbutton	635-003
S7	Toggle, DPDT	630-006
S101	Toggle, DPDT	630-006

3-9 TRANSFORMERS

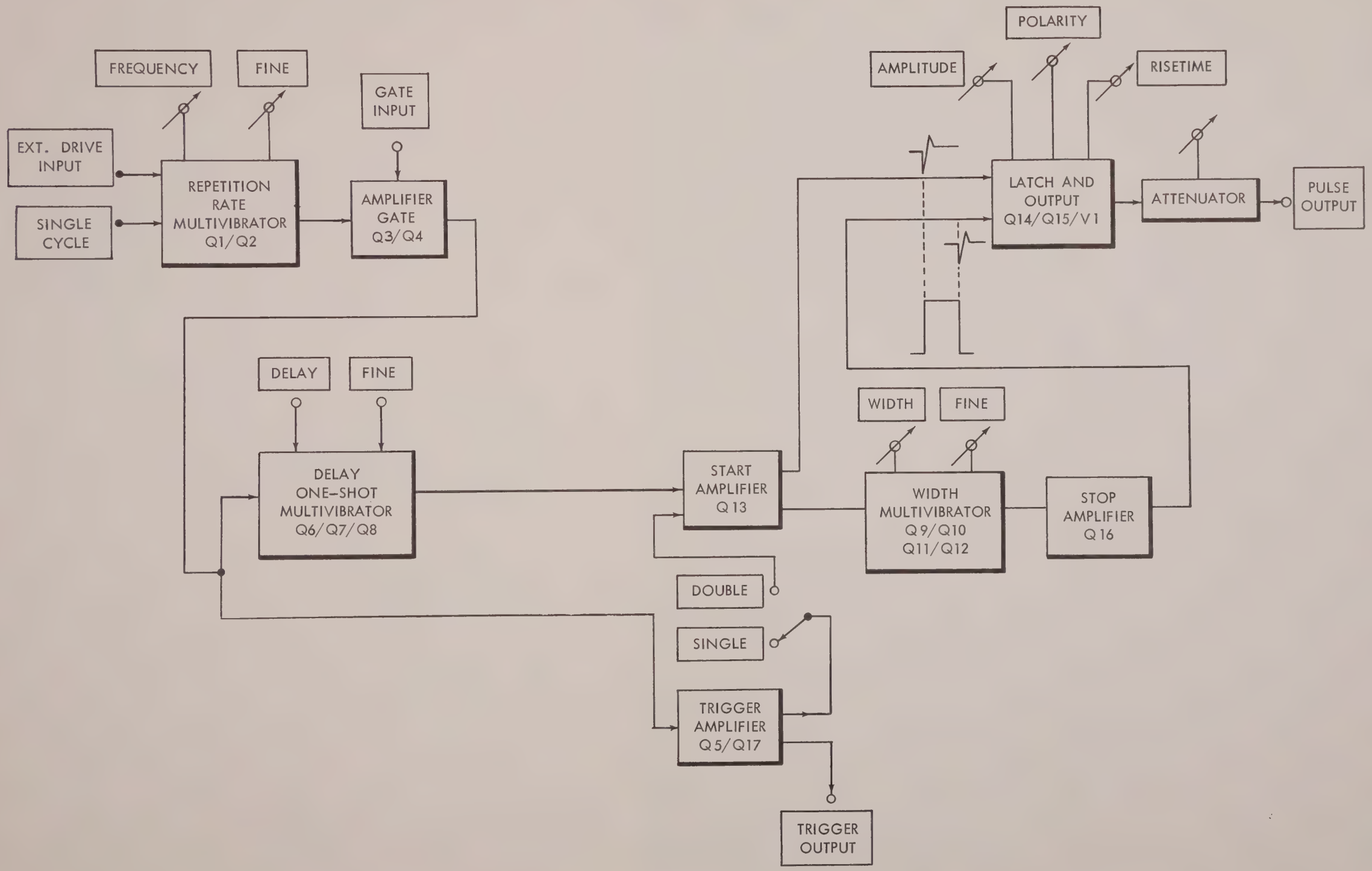
T1	E-H Special Assembly	10660
T2	E-H Special Assembly	10661
T3	E-H Special Assembly	A-10928
T101	Power Transformer	10560

3-10 TRANSISTORS

Q1	2N966	663-032
Q2	2N966	663-032
Q3	2N966	663-032
Q4	2N966	663-032
Q5	2N706A	663-022
Q6	2N966	663-032
Q7	2N966	663-032
Q8	2N966	663-032
Q9	2N966	663-032
Q10	2N966	663-032
Q11	2N966	663-032
Q12	2N966	663-032
Q13	2N2369	663-009
Q14	2N2098	11706
Q15	2N2538	663-003
Q16	2N834	663-028
Q17	2N706A	663-022
Q101	2N1309	663-021
Q102	2N1306	663-018
Q103	2N1309	663-021
Q104	2N250	11705
Q105	2N250	11705

3-11 MISCELLANEOUS

J-1	Connector, BNC UG-1094/U	721-013
J2	Connector, BNC UG-1094/U	721-013
J3	Connector, BNC UG-1094/U	721-013
J4	Connector, BNC UG-1094/U	721-013
	Core, Ferrite (4)	361-002
	Core, Ferrite (1)	361-011
	Fan Blade; 4" 10 Blade clockwise	493-004
	Fan Motor	570-001
	Fan, Venturi Tube	10322
	Fuse Holder (1)	396-001
F101	Fuse, 3A, Slo-Blo (1)	398-003
F102	Fuse, 1.5A, Slo-Blo (1)	398-013
	Insulator, Electrolytic Capacitor	330-007
	Knob, Large (1)	443-007
	Knob, Medium (4)	443-008
	Knob, Small (5)	443-009
DS1	Pilot Light Assembly, Neon Red	510-008
	Power Cord (1)	786-001
	Shaft, with Panel Bushing (3)	465-002
	Shaft Couplet (3)	465-001
	Socket, Transistor (4)	490-002
	Socket, Tube, Octal (3)	495-013
	Socket, Tube, 9 Pin Miniature (1)	495-019



MODEL 132A PULSE GENERATOR - BLOCK DIAGRAM

D-11645A

REVISIONS						
ISSUE	REVISION	DATE	DRAWN	CHK'D	APP'D	E.O.
A	ORIG RELEASE	9/27/65	KS			

FREQUENCY S1 — FINE — R2 2.5K

EXT. DRIVE INPUT — J1 — R1 2K 1/2W — C7 .001 — CR1 1N746A

C1 47 — C2 4.7 — C3 .5 — C4 .05 — C5 .005 — C6 500pf — C50 100pf — C49 7-100pf

5~ — 50 — 500 — 5KC — 50KC — 500KC — 3.5MC — EXT. — W

R50 2K

DELAY S2 — FINE — R26 10K — R25 1K

.1μs — 1μs — 10μs — 1ms — 10ms

C56 270pf — C16 .001 — C18 .1 — C19 1.0 — C20 10 — C17 .01

R27 560

S3 WIDTH — FINE — R44 10K — R38 1K — R39 10K

1μs — 10μs — .1ms — 1ms — 10ms

C29 .001 — C31 .1 — C32 1.0 — C33 10 — C30 .01

S4 POLARITY — V1 (CAP) — C48 .01 — 6 X 240, 2W — R63 — R66 — R88 — R89

S5 ATTENUATOR — OUTPUT J4

R83 5.1 1W — R82 5.1 1W — R77 13 1W — R78 13 1W — R79 13 1W — R80 12 1W — R81 3.3 1W

R71-76 6 X 240, 2W

R67-70 4 X 100, 2W

AMPLITUDE — R128 100K

S7 PULSE MODE — SINGLE — DOUBLE

SINGLE CYCLE S6 — C57 .01

GATE INPUT J3 — TRIGGER OUTPUT J2

RED — V1 SCREEN SUPPLY — +175V

GRAY — WHT/VIO — −150V

WHT/BLU — V0

A — B — C — D — E

R.F. DECK
(SCHEMATIC D-10680)

OUTPUT BOARD
(SCHEMATIC D-10684)

POWER SUPPLY
SCHEMATIC REF. D-10679

PROPRIETARY INFORMATION
NO INFORMATION GIVEN HEREIN MAY BE DISSEMINATED TO ANY PERSON OR COMPANY WITHOUT THE EXPRESS PERMISSION OF E-H RESEARCH LABORATORIES, INC.

ITEM NO.	PART NO	DESCRIPTION	QTY

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
SCALE NONE
DIMENSIONS ARE IN INCHES
DECIMALS ± XX ± XXX
ANGLES ±
MACHINED SURFACES √
DO NOT SCALE DRAWING
FINISH

NEXT ASSY — REQ'D — USED ON

E-H RESEARCH LABORATORIES, INC.
OAKLAND, CALIFORNIA

TITLE
MASTER SCHEMATIC

MODEL: 132A

	INITIALS	DATE	
DRAWN	KS	9/27/65	D-11645
CHK'D	JX	9-27	
APP'D			

ISSUE A

SHEET NO 1 OF 1 SHEETS

REVISIONS						
ISSUE	REVISION	DATE	DRAWN	CHK'D	APPV'D	E.O
G	ADDED DOUBLE PULSE	4/265	R.S.	[illegible]		65-31
H	COMP. CHANGES	7/765	RS	[illegible]		65-34
J	R50 WAS 5K	7-1465	[illegible]			65-51
K	R11 WAS 2K & ADDED C57	8-2465	S.R.			
L	ADDED TEST POINT Nº'S	9/265	R.S.			—

PROPRIETARY INFORMATION
E-H RESEARCH LABORATORIES INC
NO INFORMATION GIVEN HEREIN MAY BE DISSEMINATED TO ANY PERSON OR COMPANY WITHOUT THE EXPRESS PERMISSION OF E-H RESEARCH LABORATORIES, INC

D-10680 L

TITLE: SCHEMATIC RF DECK MODEL 132A

D-10680 L

SHEET NO ___ OF ___

EXT. DRIVE INPUT

C1 — C5: 4.7, .5, .05, .005

50 KC / 500 KC / 3.5MC

7-100PF C49

100 PF C50

500 PF C6

S7B

R50 2K

+5.1V

R1 2K 1/2W

EXT

C7 .001

CR1 1N746

S1

FREQUENCY

FINE

2.5K R2

TP1 — 2.0 — 5.0

GATE INPUT

TRIGGER OUTPUT

.03μS — 0 — -5.0

S2

C16

C20

.001 .1μs

.01 .1μs

1 10μs 1 ms

1 1 ms

10 20V 10% 10 ms

2K R43

DELAY

FINE

1K R25

10K R26

560 R27

TP3 — -2.8 — -3.7 — -4.7

S3

C29

C33

.001 .1μs

.01 .1μs

1 10μs 1 ms

1 1 ms

10 20V 10% 10 ms

10K R44

WIDTH

FINE

1K R38

10K R39

-5.1V

C57 .01

SINGLE CYCLE S6

C51 .01

C52 .01

R29 1K

R11 1M

R42 110

R45 2 Meg

L1

L10 1.5μh

C8 25

C9 .01

100 R3

150 R7

200 R8

IN751A CR3

Q1 2N966 Q2 2N966

10 R4

10 R6

1K R9

CLOCK MULTIVIBRATOR

C12 10P

IN914B CR4

AMPLIFIER

Q3 2N966 Q4 2N966

GATE AMPLIFIER

CR 6 IN270

CR 7 IN746

IN270 CR5

2.4K R15

C13 100PF

CR8-9 2x IN270

C14 .01

220 R17

30K R18

75 R19

Q5 2N706A

C15 150PF

TRIGGER OUTPUT AMPLIFIER

IN270 CR10

CGD1419 CR11

750 R20

Q6 2N966

DELAY MULTIVIBRATOR

Q8 2N966

R24

L11 .5μh

180 R23

Q7 2N966

CGD1419 CR12

C21 25

C22 .01

L4

75 R35

Q12 2N966

L2 .5μh

160 R37

Q10 2N966

WIDTH MULTIVIBRATOR

Q11 2N966

CGD1419 CR15

560 R40

L6

C27 25

C28 .01

-5.1V

Q9 2N966

CGD1419 CR13

IN270 CR14

750 R34

CGD1419 CR12

3K R10

180 R5

C10 25

C11 .01

22K R12

300 R13

18K R14

R41 180

R28 220

Q17 2N706A

TRIGGER OUTPUT AMPLIFIER

CR31 IN270

CR32 IN270

C53 100 PF

R16 180

T3 A-10928

CR33 CGD1419

330 R21

430 R22

C23 25

C24 .01

L3

2K R30

300 R31

330 R32

430 R33

C25 25

C26 .01

L5

Vo,GND

+5.1V

L2

+5.1 V

PRINTED CIRCUIT BOARD

DOUBLE

SINGLE

S7A

PULSE MODE

TP2 — -2.6 — -3.7 — -4.7

TO Q13 BASE

TO OUTPUT SCHEMATIC

NOTES:
UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTANCES GIVEN IN OHMS.
2. ALL CAPACITANCES GIVEN IN MICRO-FARADS (PF = PICO FARADS).
3. WAVEFORMS OBSERVED ON "TEKTRONIX" MODEL 541A OSCILLOSCOPE (TYPE L PLUG-IN).
MODEL 132A CONTROLS SET AS FOLLOWS:
(A) FREQUENCY RANGE - 50KC TO 500KC, FINE-SET TO MAX. (FULL CW)
(B) DELAY RANGE - 1.0μS TO 10μS, FINE - SET TO MIN (FULL CCW)
(C) WIDTH RANGE - 1.0μS TO 10μS, FINE - SET TO MIN (FULL CCW)

QTY -01	ITEM NO.	PART NO.	DESCRIPTION	SCHEMATIC OR SPEC. REF

MATERIAL LIST

REQ'D | USED ON | NEXT ASS'Y | VAR.

UNLESS OTHERWISE SPECIFIED
SCALE:
DIMENSIONS ARE IN INCHES
TOLERANCE FRACT.: ±
DECIMALS: ±
ANGLES: ±
HOLE DIAMETERS: ±
MACHINED SURFACES: √
BREAK & DEBURR SHARP EDGES
DO NOT SCALE DRAWING
FINISH:

E-H RESEARCH LABORATORIES, INC.
OAKLAND, CALIFORNIA

TITLE: SCHEMATIC RF DECK MODEL 132A

	INITIALS	DATE	I.O. NO.	DWG NO.	ISSUE
DRAWN	AAS	8-2742		D-10680	L
CHK'D	[illegible]	9-27			
APP'D				SHEET NO. ___ OF ___ SHEETS	

REVISIONS						
ISSUE	REVISION	DATE	DRAWN	CHK'D	APP'D	E.O.
A	ORIG. REL.	8/62				
B	REVISED	9/63				
C	REVISED	6/1/63	LB	RH		
D	R57,58,59 WERE 18K 2W 5%	9/6/63	NSH	RH		63-63
E	Q13 WAS 2N706A-Q14 WAS 663-0108	10/7/63	NSH	RH		63-78
F	C36 WAS 50P & CR18 WAS IN914B	4-16-64	RS	RH		64-320
G	Q16 WAS 2N706A	9/1/64	RS	RH		64-92
H	ADDED SELECTED RESISTOR	9/16/64	RS	RH		64-59
J	RESISTOR CHANGE	11/6/64	RS	RH		64-71
K	DIODE CHANGES	11/14/64	RS	RH		65-31
L	CR16 WAS IN914B	1/7/65	RS	RH		65-56
M	ADDED TEST POINT Nº'S	2/17/65	R.S.			—

PROPRIETARY INFORMATION
E-H RESEARCH LABORATORIES, INC.
NO INFORMATION GIVEN HEREIN MAY BE DISSEMINATED TO ANY PERSON OR COMPANY WITHOUT THE EXPRESS PERMISSION OF E-H RESEARCH LABORATORIES, INC.

D-10684 M

TITLE: SCHEMATIC OUTPUT MODEL 132A — D-10684 M — SHEET NO. ___ OF ___

TO RF DECK SCHEMATIC

A B C D E

TP8: 0V, −40, .1μS, .03μS

TP7: +5.1, +1.2, .18μS

TP5: +.2, −.6, .35μS — Q16 REMOVED

TP6: +5.1, +3.4, .18μS

TP4: +1.8, −.6, .35μS — Q13 REMOVED

L7, L8

C34-C35: .01, 25

C36 100PF, C37 150PF, C38 100PF, C39 .001, C40 50PF, C41-C42: .01, 25

Q16 2N834 — STOP AMPLIFIER

Q13 2N2369 — START AMPLIFIER

CR16 CGD1419, CR17 IN270, CR18, CR19 IN270

3.3K R46, 330 R47, 5.1K R48, 430 R49, 1K R87

T1, T2

LATCH CIRCUIT

R51 — R54, −150

22K 1W, 16K 2W, 16K 2W, 56K

CR20, CR21, CR22, CR23, CR24, CR25, CR26 IN914B, CR27 IN914B, CR28 1.5M39Z5, CR29 IN914B, CR30 IN914B

Q15 2N2538, Q14 2N2098

4.3K R55, 15 R61, C43 .1, 3.9K R85, 82K R84, 47K 1W R86

R57-R59 3x33K 2W *FAC.SEL.

TP9: +42, −150, .5μS — NOTE – INCREASE "WIDTH" TO .5μS PULSE

OUTPUT CIRCUIT

SCREEN SUPPLY: +175, C44 .1, 110 R62, C45 .01, C46 1.0

RISE TIME: R60 500, V1 7534

POLARITY: S4

6x240 2W R63-R66, C47 .01, C48 .01

ATTENUATOR: S5

OUTPUT

4x100 2W R67 R70, 6x240 2W R71 R76, 2x13Ω,1W R77-R78, 13,1W R79, 5.1Ω,1W R82, 12,1W R80, 5.1Ω R83, 3.3,1W R81

1, 2, 5, 10, 20, 50

+50, 0, 0.1μS

PRINTED CIRCUIT BOARD

Vo

TP10: +50, −39, 0.1μS

NOTES:
UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTANCES GIVEN IN OHMS.
2. ALL CAPACITANCES GIVEN IN MICRO-FARADS (PF=PICO FARAD)
3. WAVEFORMS OBSERVED ON "TEKTRONIX" MODEL 541A OSCILLOSCOPE (TYPE L PLUG-IN). MODEL 132A CONTROLS SET AS FOLLOWS:
   (A) FREQUENCY RANGE – 50KC TO 500KC, FINE – SET TO MAX. (FULL CW)
   (B) DELAY RANGE – 0 μS TO 1.0 μS FINE – SET TO MIN. (FULL CCW)
   (C) WIDTH RANGE – 0.1 μS TO 1.0 μS FINE – SET TO MIN. (FULL CCW)
   (D) RISE TIME – SET TO MIN. (FULL CCW)
   (E) AMPLITUDE – SET TO MAX. (FULL CW)
4. * FACTORY SELECTED.
5. ALL DIODES ARE, CGD 1419. 6. TP – INDICATES TEST POINT IN CIRCUITRY.

MATERIAL LIST

QTY	ITEM NO.	PART NO.	DESCRIPTION	SCHEMATIC OR SPEC. REF

REQ'D — USED ON — NEXT ASS'Y — VAR.

UNLESS OTHERWISE SPECIFIED
SCALE
DIMENSIONS ARE IN INCHES
TOLERANCE FRACT.: ±
DECIMALS: ±
ANGLES: ±
HOLE DIAMETERS: ±
MACHINED SURFACES: √
BREAK & DEBURR SHARP EDGES
DO NOT SCALE DRAWING
FINISH:

E-H RESEARCH LABORATORIES, INC.
OAKLAND, CALIFORNIA

TITLE: SCHEMATIC OUTPUT MODEL 132A

	INITIALS	DATE
DRAWN	AAE	8-28-62
CHK'D	[illegible]	[illegible]
APP'D	[illegible]	[illegible]

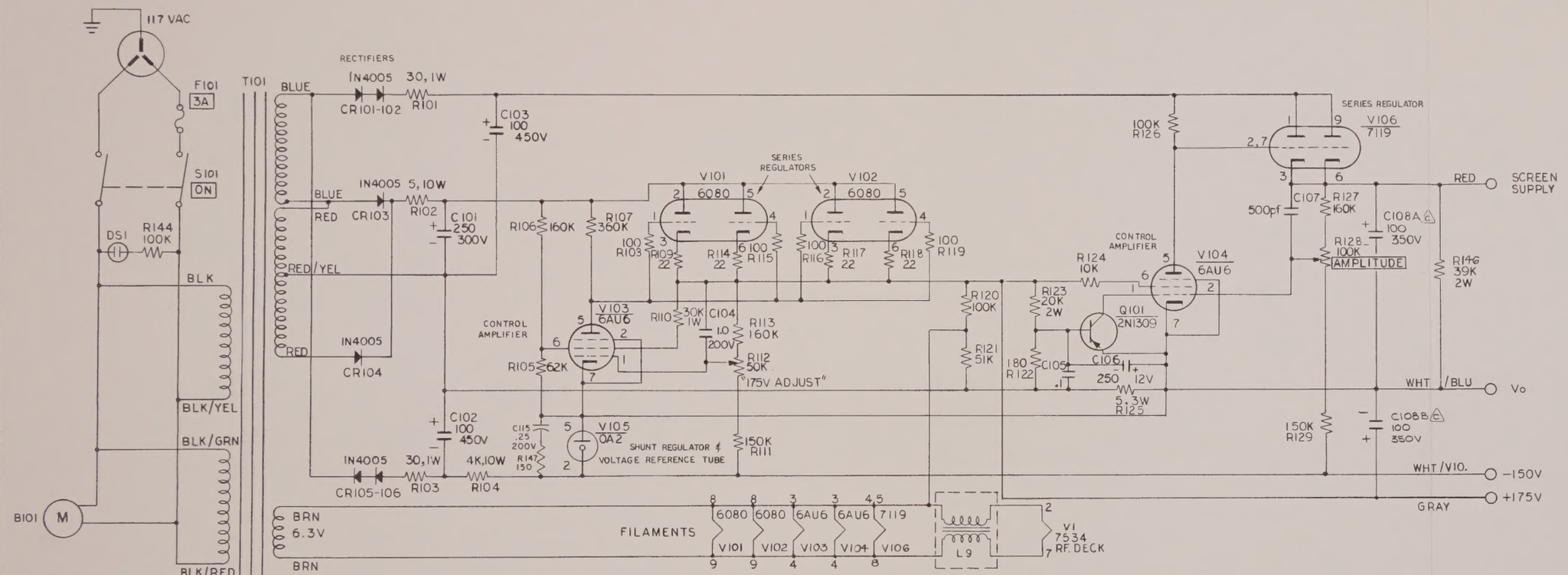
I.D. NO. — DWG. NO. D-10684 M — ISSUE M — SHEET NO. 1 OF 1 SHEETS

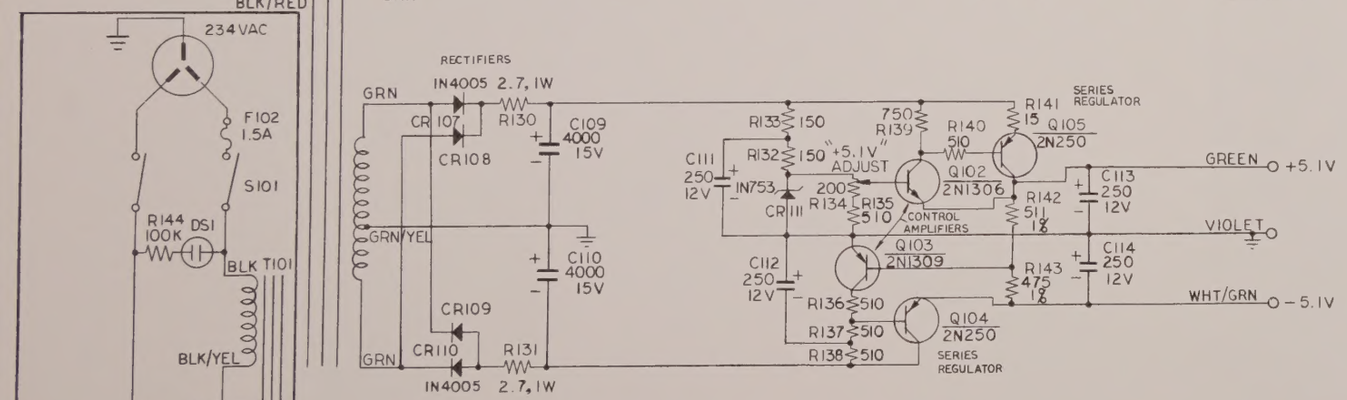
REVISIONS						
ISSUE	REVISION	DATE	DRAWN	CHK'D	APP'V'D	E. O.
A	ORIGINAL	8/15	AAS			
B	REVISED	3/63				
C	C108 WAS 100uf/450V	4-29-64				64-20
D	ADDED CIRCUITRY IDENT-	11-10-65	R.S.			-
E	ADDED C115 & R147	11-10-65				65-93

PROPRIETARY INFORMATION
E-H RESEARCH LABORATORIES, INC.
NO INFORMATION GIVEN HEREIN MAY BE DISSEMINATED TO ANY PERSON OR COMPANY WITHOUT THE EXPRESS PERMISSION OF E-H RESEARCH LABORATORIES, INC.

D-10679 E

TITLE: MODEL 132 POWER SUPPLY — D-10679 E — SHEET NO. ___ OF ___





PRIMARY CONNECTION OF TRANSFORMER FOR 234 V AC

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCES GIVEN IN OHMS
2. ALL RESISTORS ARE $\frac{1}{2}$W, 5%
3. ALL CAPACITANCES GIVEN IN MICRO-FARAD. (Pf = PICO FARADS)

QTY -01	ITEM NO.	PART NO.	DESCRIPTION	SCHEMATIC OR SPEC. REF

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
SCALE:
DIMENSIONS ARE IN INCHES
TOLERANCE FRACT'L ±
DECIMALS: ±
ANGLES: ±
HOLE DIAMETER: ±
MACHINED SURFACES: √
BREAK & DEBURR SHARP EDGES
DO NOT SCALE DRAWING
FINISH:

REQ'D | USED ON | NEXT ASS'Y | VAR.

E-H RESEARCH LABORATORIES, INC.
OAKLAND, CALIFORNIA

TITLE: MODEL 132 A POWER SUPPLY

	INITIALS	DATE	I.O. NO.	DWG. NO.	ISSUE
DRAWN	AAS	8/15		D-10679	E
CHK'D		12/2/65			
APP'D		12/2/65		SHEET NO. 1 OF 1 SHEETS	